AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claim 1 (Previously presented): A method for fabricating an etched grooved GaN-based permeable-base transistor device, comprising:

opening a window for helium implantation on a hydride vapor phase epitaxy (HVPE) grown n^+ GaN quasi-substrate layer, using optical lithography;

implanting helium on the n+ GaN quasi-substrate layer over the window for helium implantation, so as to provide an insulating layer for contact pads of the device;

opening a window for collector fingers using E-beam lithography;

depositing an ohmic metallization layer over the window for the collector fingers;

lifting-off ohmic metallization, thereby forming the collector fingers;

opening a window for a self-aligned base recess using optical lithography;

etching to recess a base layer to an n^- GaN quasi-substrate layer grown on the n^+ GaN quasi-substrate layer, wherein the etching is performed with a ramp down in chuck bias voltage wherein said ramp down is from a high chuck bias voltage to a low chuck bias voltage;

opening a window for a collector contact pad, using optical lithography;

depositing a high quality silicon nitride layer over the window for a collector contact pad; and

lifting-off or wet chemical etching the high quality silicon nitride layer, thereby forming a silicon nitride collector contact pad.

Claim 2 (Canceled):

Claim 3 (Previously presented): The method of claim 1 wherein the high quality silicon nitride layer is about approximately 1000-2000Å thick, and is deposited over the window for helium implantation via plasma enhanced chemical vapor deposition (PECVD).

Claim 4 (Previously presented): The method of claim 1 further comprising:

opening a window for Ti metallization of the collector contact pad using optical lithography;

depositing Ti over the window for Ti metallization of the collector contact pad; and

lifting-off Ti metallization, thereby forming a Ti collector contact pad.

Claim 5 (Original): The method of claim 4 further comprising:

opening a window for a second Ti metallization of the collector contact pad using optical lithography;

depositing Ti over the window for the second Ti metallization of the collector contact pad; and

lifting-off second Ti metallization, thereby forming a Ti cap over the collector contact pad.

Claim 6 (Previously presented): The method of claim 1 wherein depositing Ti over the window for Ti metallization of the collector contact pad includes depositing Ti/Au at thicknesses of about approximately 500Å/1000Å, respectively, using e-beam evaporation.

Claim 7 (Canceled).

Claim 8 (Previously presented): The method of claim 22 further comprising base metallization and wherein an anneal is performed after said base metallization so as to provide the base contact pad with low reverse current leakage and low contact resistance.

Claim 9 (Original): The method of claim 1 further comprising:

opening an emitter etch/contact window using optical lithography;

etching an emitter recess to the n^+ GaN quasi-substrate layer;

depositing an emitter ohmic metallization layer over the etched emitter recess; and

lifting-off emitter ohmic metallization, thereby forming an emitter contact pad.

Claim 10 (Original): The method of claim 1 wherein the emitter ohmic metallization layer includes at least one of titanium, aluminum, nickel, and gold.

Claim 11 (Canceled).

Claim 12 (Currently Amended): The method of claim 1 wherein the helium implantation is achieved with an implant depth of about approximately 2 μm.

Claim 13 (Original): The method of claim 1 wherein the ohmic metallization layer over the window for the collector fingers is Ti/Ni with thicknesses of 100Å and 400Å, respectively.

Claim 14 (Previously presented): The method of claim 1 wherein the device has a plurality of collector fingers about approximately 0.2 μm wide and having a finger pitch between 1:1 and 1:3.

Claims 15 -21 (Canceled)

Claim 22 (Previously presented): A method for fabricating an etched grooved GaN-based permeable-base transistor device, comprising:

opening a window for helium implantation on a hydride vapor phase epitaxy (HVPE) grown n^+ GaN quasi-substrate layer, using optical lithography;

implanting helium on the n+ GaN quasi-substrate layer over the window for helium implantation, so as to provide an insulating layer for contact pads of the device;

opening a window for collector fingers using E-beam lithography;

depositing an ohmic metallization layer over the window for the collector fingers;

lifting-off ohmic metallization, thereby forming the collector fingers;

opening a window for a self-aligned base recess using optical lithography;

etching to recess a base layer to an n^- GaN quasi-substrate layer grown on the n^+ GaN quasi-substrate layer, wherein the etching is performed with a ramp down in chuck bias voltage; depositing conformal silicon nitride for passivation of the recessed base layer;

directionally etching to remove silicon nitride on planes parallel to the n^+ GaN quasi-substrate layer;

depositing a base metallization layer; and

lifting-off base metallization, thereby forming a base contact pad.

Claim 23 (Previously presented): The method of claim 22 wherein an emitter ohmic metallization layer includes at least one of titanium, aluminum, nickel, and gold.

Claim 24 (Previously presented): The method of claim 22 wherein the helium implantation is achieved with an implant depth of about approximately 2 μm.

Claim 25 (Previously presented): The method of claim 22 wherein the ohmic metallization layer over the window for the collector fingers is Ti/Ni with thicknesses of 100Å and 400Å, respectively.

Claim 26 (Previously presented): The method of claim 22 wherein the device has a plurality of collector fingers about approximately 0.2 μm wide and having a finger pitch between 1:1 and 1:3.